Timeless Equations

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Why time does not exist in reality ?

Time is spoken of as if it were a substance running through the world, a river that carries all things from birth to disappearance. Yet when the world is examined honestly, with the mind of a logic rather than the habits of a population, nothing in nature reveals a force called time. What exists is movement. What exists is change. What exists is the sequence in which events unfold. Time itself never appears. The idea of time exists only in the human mind, not in the cosmos.

Clocks do not show time; they show mechanical cycles. Calendars do not measure time; they count planetary rotations and revolutions. People think seasons come "with time," but seasons arrive through physical causes: the angle of the planet, the movement of light across the surface, the shifting of climate. If every clock and calendar vanished, winter would still freeze the rivers, spring would still rise from the soil, and the world would continue its unfolding without hesitation. This reveals the truth that so many fear to see: the idea of time is a human invention, nothing more.

Take history. People say the Romans lived "two thousand years ago," but there were no years. There were only bodies appearing, acting, eroding, and disappearing. Those bodies were not separated from us by a force called time. They are separated only by events. Buildings were raised, battles were fought, stones crumbled, languages transformed, and thousands of human generations lived through their sequences of actions. The illusion comes when humans number these sequences and call the numbers "years." Without the numbers, events remain exactly the same.

A Victorian factory did not exist "one hundred and fifty years ago." It existed after a certain chain of human actions, inventions, and conditions. People were simply less developed in thought, built simpler machines, and wore clothing that suited the habits. Later, other bodies appeared with sharper thinking, better tools, and different choices. No mysterious force carried them from one age to the next. They did not "travel forward in time." They lived through sequences of event after event.

When someone moves from one place to another, nothing in their path requires the existence of time. Movement is only distance covered by a body with speed. The object is at point A, then it is at point B. It has either arrived or it has not. Humans add "minutes," "hours," and "duration," but these are added for convenience, not because reality needs them. The cosmos does not calculate minutes. It only moves, shifts, and changes.

Even what people call aging is not caused by time. A body does not decay because a clock ticks. A body decays because matter wears down. Cells fail. Structures weaken. Energies dilute. Everything made of the world's substance erodes under the world's laws, not under a timeline. If clocks were destroyed, bodies would still break. If calendars were burned, bones would still thin, skin would still wrinkle, and organs would still weaken. This shows again that time is not a cause. Time is a word humans use to describe processes they cannot control.

When the illusion of time is removed, what remains is the structure that truly governs reality: the order of events. Everything that has ever existed, everything that exists now, and

everything that will arise later can be described without using time at all. A body moves; another body reacts; a cloud drifts; a stone breaks. These are events. They follow one another, overlap, or unfold together. The world is nothing but this endless weaving of physical occurrences. Humans take this natural unfolding and attach numbers to it, creating “hours” and “years,” but numbering does not change the nature of what is happening. It merely labels it.

The simplest example reveals the whole truth. A car begins to move. This is Event One. A person takes a step. This is Event Two. A cloud shifts slightly across the sky. This is Event Three. At times, these events happen separately; at times, they happen simultaneously. The order of events describes reality completely. Nothing requires time to exist to understand these transitions. The world never pauses to measure itself. It only acts.

When someone says, “This happened long ago,” what do they actually mean? They mean that many events have unfolded since that earlier event. They do not mean that a cosmic entity called time has transported them over a distance between two points in a metaphysical timeline. They mean simply that many changes have occurred. If one says, “This happened recently,” they mean fewer events unfolded between that earlier action and the present one.

Memory supports this truth. The human mind does not record time. It records order. It remembers that one action came before another. It remembers that one event followed after a different cause. When someone recalls childhood, they do not recall “years.” They recall the order of experiences: the first school, the first winter coat, the first injury, the first victory. These events were not divided by time; they were divided by change.

Even the great histories are written in sequences. Before the factories came, there were fields; before fields, there were tribal dwellings; before that, wandering groups building fires. Humans believe these transitions happened “through time.” But if they removed the concept of time entirely, nothing in the structure of history would change. The events would still follow the same order. The rise and fall of empires would still be the same chain. All that would vanish is the illusion of a timeline stretching across the cosmos.

Thus, to understand reality, one must replace the notion of “time” with the truth of “event order.” This shift removes confusion and aligns the mind with how the cosmos actually behaves. It is not guided by time. It is guided by movement and transformation.

The common belief is that time “passes,” that it carries all things forward. Yet nothing in reality behaves as if carried by anything. Change occurs because matter interacts, not because time flows. When iron rusts, it does so because oxygen binds to its surface, not because years are slipping past. When a tree grows, it does so because cells divide and absorb nutrients, not because some invisible river called time pushes it upward. When bodies weaken, they do so because the material structures that compose them gradually fail, not because clocks command them to.

If time truly existed as a force, internal perception would not change it. A tired person often feels that events “take longer,” while a rested person feels they “happen quickly.” This alone proves that these impressions arise from within the human body, not from the world. If time were a cosmic element, human exhaustion could not slow it, and human clarity could not speed it. Yet tiredness stretches experience and alertness compresses it. What people interpret

as “long” or “short” is nothing more than the mind counting how many internal changes it notices between external events.
The illusion becomes obvious when two people witness the same sequence. One says, “The day was long.” The other says, “It passed quickly.” If time were real, both would experience the same duration. But they do not. This shows that the concept of duration does not come from the world; it comes from the perceiver. There is no physical stretching or shrinking of the cosmos. There is only the state of the observer: their clarity, their attention, their fatigue, their expectation.
In truth, when two events occur, the only statement that matches reality is that one came before the other, or that they occurred together. Anything beyond this — “hours,” “minutes,” “long,” “short” — comes from human mental habits. These habits were created for coordination, not for describing truth. A farmer needed to know when to plant. A sailor needed to know when tides rose. A merchant needed to know when a journey would finish. Clocks and calendars arose from these needs. But they measure cycles, not time.
Even in travel, where people claim time is necessary, the reality is simpler. A body moves from point A to point B. It covers distance with a certain velocity, which is just the rate at which it displaces itself. There is no experience of “time passing” in the movement itself. The body is either traveling or has arrived. The cosmos does not ask what hour it is. It simply continues its motion without pause.
Thus the world reveals a simple but powerful truth: time is not a feature of reality. It is a mental interpretation layered over change. The body wears down through physical amortization, not age. History unfolds through sequences of events, not years. Perception expands and contracts based on the body’s state, not based on any external clock. When humans speak of time, they are speaking of their own thinking, not of the universe.

When historians speak of eras, centuries, and ages, they imply that time itself divides the world into compartments. Yet when we remove numbers and names, nothing in history changes. The Roman Legion did not march in a “year.” It marched during a particular set of events. The stones of their structures rose through labor, tools, sweat, and will. Those stones collapsed later because their material weakened. None of this requires time as a real entity.
A Roman citizen was not a figure from “two thousand years ago.” He was simply a body operating within a different chain of physical, social, and cultural events. If we stopped using the calendar system entirely, Romans would still have existed before the Victorians, and Victorians before the modern people. The sequence of cultures, inventions, and ideas remains intact. What disappears is only the illusion that a separate dimension called time carried humanity across these transitions.

Consider Victorian England. People imagine it as a distant place in time, yet it is merely a point in the order of human development. During that sequence of events, people built steam engines, wrote with quills, and dressed in specific fashions. Later sequences brought electricity, radios, internal combustion engines, and screens. These changes arose not from time but from shifting human thought, available materials, and the conditions of the physical world. The idea that “150 years have passed” adds nothing to the explanation. It repeats the

illusion that time itself caused development, when in truth development results from accumulated events and improved thinking.
When a historian says, “This happened in the 12th century,” he is not describing reality. He is describing a position within a man-made numbering system. The reality underneath is that certain events followed others: migrations, harvests, battles, constructions, discoveries. The numbering serves as a map for memory, not as a feature of the cosmos. Erase the numbers, and the true order remains.
Memory itself reveals the truth. The mind does not recall years. It recalls sequences. It says, “First I lived in that house, then in another.” It says, “I met this person after that journey.” It does not store time, only the order of experiences. When people believe they remember “how long ago” something happened, they are actually remembering how many events have occurred since then, and how much they themselves have changed physically and mentally.
If the concept of time were removed from history entirely, every historical narrative could still be told with perfect clarity: this culture rose after that one; this invention followed these discoveries; this collapse occurred after these conditions formed. Time is not needed as an element. Sequence is enough.
Thus the world’s past appears without dividing itself into temporal layers. All that exists is an unbroken chain of events. Time is nothing more than a set of labels humans place upon this chain. It is not a structure in the cosmos. It is a tool for orientation, like marking a path with stones so one does not get lost. The stones help the traveler, but they are not the land.

When a body moves from one place to another, its change of position is often described as taking a certain amount of “time.” Yet the movement itself contains no such thing. It begins in one configuration of matter and ends in another. Between these two states, the body changes position in space according to its speed, which is nothing more than the relationship between distance and physical capability.
To say that a journey “took an hour” is to describe nothing in the journey itself. It is to describe only how humans chose to measure cycles of a mechanical device while the movement occurred. If every clock in the world were shattered, bodies would still travel. Roads would still be crossed. Objects would still fall or rise. The cosmos would not tremble because its imaginary schedule had been disrupted. This reveals the truth that time is not an ingredient of motion; motion is an ingredient of the world.
People often believe that “time passes” during an event, but what truly passes is the arrangement of matter. A river flows because its water obeys gravity, terrain, and pressure. A planet rotates because of angular momentum. A human walks because muscles contract and bones pivot. In none of these processes does the cosmos insert an entity called time. Humans speak of time only because they track cycles of light and dark, the turning of gears, or numbers on screens. But light and dark come from planetary movement; gears turn because mechanics push them; numbers change because electricity flows. The appearance of time is generated by movement, not the other way around.
This is why the world continues with perfect indifference to human schedules. Storms ignore calendars. The cosmos does not postpone an eclipse because the day is inconvenient. Matter responds to forces, not to hours. The illusion lies in humans believing that their schedules describe nature itself, when in truth those schedules describe only patterns of human thought.

Humans often believe that time is experienced internally. They say a day felt “long” or “short,” as if length existed outside of perception. But this feeling comes entirely from the state of the body. When the body is tired, perception becomes dull and fragmented; the mind registers fewer external changes with clarity and fills the gaps with a sense of stretching. When the body is alert, perception is steady and continuous; events seem to follow one another without interruption, giving the impression of quickness. The world does not expand or contract; the perceiver does.

This alone exposes the falseness of duration. If two people sit in the same room and experience the same sequence of events, yet one claims it lasted “forever” and the other claims it “flew by,” then duration cannot be a property of the world. It must be a property of the perceiver’s state. The cosmos acts with the same indifference regardless of who is watching it. Human impressions are reflections of their own body’s condition, not reflections of an external temporal dimension.

Even memory proves this. People do not remember time; they remember order. A person recalls that breakfast came before a walk, that a conversation came before sleep, but they do not remember “how long” except through interpretation. A man may say childhood felt long and adulthood short, but what he truly means is that childhood contained many internal changes, many new sensations, many first encounters, whereas adulthood contains repetitive patterns that register as fewer internal events. The illusion of duration is created by the density or sparsity of internal experience, not by any external flow.

Thus, impressions of length or brevity expose no cosmic truth. They reveal only the variability of human attention. Time does not expand or collapse; only perception does.

The belief that bodies age because “time passes” is among the greatest illusions. Bodies do not age because of time. Bodies age because of physics, biology, and decay. Molecules break apart. Cells lose their ability to divide. Proteins misfold. Organs accumulate damage. Joints wear down through repeated movement. All of this is the amortization of matter, not the passage of time.

If time truly aged bodies, then removing clocks would halt aging, and adding more clocks would accelerate it. But bodies age even in darkness, even when no one counts days, even when calendars are forgotten. A person isolated from all knowledge of time still grows old because aging is a material process. It is not driven by minutes; it is driven by chemical breakdown.

To say “I am forty years old” is merely to say “my body has undergone this many cycles of decay and renewal.” It is not a measurement of time; it is a measurement of change. This is why two bodies with the same numerical age can appear very different: one may be heavily worn, the other barely aged. If time were the cause, bodies of the same age would decay identically, yet they do not. What matters is not how many “years” have passed but how much physical stress, nutrition, illness, and wear the body has endured.

Thus aging proves nothing about time. It proves only that matter fails according to its nature.

When we strip away numbers, clocks, calendars, and social constructs, the cosmos reveals its true structure: a universe made entirely of events. One event follows another. Some events arise together, overlapping like waves. None are separated by time; they are separated by

change. Each event alters the state of matter in some way — a leaf falling, a flame flickering, a heart beating, a star bursting.
If one wished to describe the history of the universe with perfect accuracy, one would not use dates. One would use sequences: event 1, event 2, event 3. The number is not what matters. What matters is that certain events came before others. In this sense, even the idea of "the past" becomes unnecessary. The past is merely the set of events whose effects remain visible. Likewise, the future is not a place ahead of time. It is simply the set of events that have not yet occurred. What humans call "the flow of time" is nothing more than the unfolding of these events, guided by the laws of matter and motion. The universe does not look down upon itself to ask what hour it is. It acts, shifts, changes, and transforms in perfect obedience to physics.
We are left with a reality that is simple, clean, and free of illusion. There is the world. There are bodies within it. These bodies move, wear down, interact, and transition from one state to another. Humans, seeking orientation, create time as a mental scaffold. But the scaffold is not the building. It helps them climb, but it does not support the cosmos.

Causality is often mistaken for proof that time exists. People say a cause must come "before" an effect, as if this "before" were a position in a temporal dimension. But nothing in causality requires time. A cause is simply an event whose physical changes lead directly to another event. The connection is not temporal; it is mechanical.
When a stone strikes a window, the window breaks because force was transferred through matter. There is no time acting between the impact and the shattering. There is only motion of particles, pressure exceeding structural limits, and glass fragments separating. The illusion of time appears when humans place numbers on this transition. But the window breaks whether or not anyone is measuring cycles.
If a spark touches dry grass, flames rise. If a body receives sufficient harm, consciousness ceases. If heat increases in a pot, water turns to steam. These are chains of cause and effect, not demonstrations of time. Each event changes the conditions of matter, which produce the next event. What humans call "temporal order" is simply the natural order of physical change.
Even in the most complex systems — societies, ecosystems, planetary movements — causality operates without any involvement from time. A drought leads to famine because reduced water weakens crops. A star explodes because internal pressure overwhelms gravitational collapse. A culture collapses because internal contradictions lead to instability. None of these processes depend on a timeline. They depend on how matter responds to forces.
Humans who say "the effect occurs later in time" are merely stating that the chain of events continues. The cause did not push the effect through a temporal corridor; it altered the world in a way that the effect became inevitable. Causality is about necessity, not time. Remove time from the explanation, and causality remains untouched.
Thus we see that the world is built on sequences, not on temporal flow. A cause does not occur in the past; it occurs in the event chain that precedes the present configuration. The effect does not occur in the future; it occurs in the next configuration. Time adds nothing to this understanding. It only clouds it with poetic language.

The cosmos acts. Humans interpret.

Clocks are often treated as evidence of time, yet they are the very tool that generates the illusion. What a clock truly shows is the repetitive motion of gears, electrons, pendulums, or photons. These cycles are physical events, not manifestations of time. The consistency of these events allows humans to use them as a reference system for coordination, but the reference is not the reality.
When a mechanical clock ticks, its gears rotate at a steady rate because of engineering. When a digital clock displays numbers, it does so because electrical pulses trigger changes in circuitry. When the Earth rotates, humans call that a "day." When it completes a revolution around the sun, humans call that a "year." None of these cycles reveal time; they reveal motion.
If someone builds a machine that clicks once per second, they do not prove the existence of time — they prove only that the machine clicks rhythmically. If another machine clicks twice as fast, "time" does not speed up. These machines measure their own events, not a cosmic dimension. Clocks and calendars are a human invention for their own orientation..
Clocks are powerful because they create agreement among people. They allow activities to align: meetings, travel, trade, agriculture. But agreement is not reality. If all clocks suddenly stopped and all calendars were forgotten, nothing in nature would change. The world would not pause, hesitate, or become confused. Clocks coordinate humans, not the universe.
This reveals the core illusion: humans mistake their instruments for fundamental forces. They believe that because clocks count, something called "time" must exist. But clocks count movement. They do not reveal anything deeper than cycles of matter.
Thus, clocks are tools of orientation, not windows into the nature of reality.

Although time does not exist in the cosmos, it serves a clear function among Earthborn. People need structure to navigate the complexity of shared life. Fields must be planted when weather allows. Ships depart when the tide returns. Workers gather when their duties require. Without a shared counting system, society would fall into confusion.
Time is therefore a practical invention — a map drawn over the landscape of events. A map helps travelers, but it is not the land. A calendar helps coordination, but it is not the universe. Humans forget this distinction and begin to treat the map as the territory. They imagine time flowing around them, pushing them forward, aging them, carrying them through eras.
In truth, nothing carries them. They move. Their bodies change. Their environments shift. Time as a concept allows humans to speak about these changes in a simplified language, but the simplification should not be mistaken for an independent entity.
Society functions more easily with numbered cycles, yet the numbers do not alter reality. If the calendar were rearranged tomorrow, crops would still grow according to sunlight and soil, not according to human numbering. If the concept of minutes and hours vanished, people would still sleep when tired and wake when rested. Society uses time; reality does not.

When one removes the illusion of time, the world appears as it is: a continuous unfolding of events, each one altering the state of matter. Instead of asking "When did this happen?" one asks "What events preceded this?" Instead of asking "How long did this take?" one asks

“What changes occurred between the beginning and the end?” Instead of saying “This was a long day,” one says “My body perceived many events.” These questions and statements reflect the world directly, without the filter of temporal interpretation.
An event-based view brings clarity. It removes the burden of imaginary aging. It reveals that decay is physical, not temporal. It shows that history is sequence, not distance. It exposes that clocks describe their own motion, not the cosmos. It reminds us that the world is made of matter, not of minutes.
This view aligns with the teachings of the Order of Epigenes, which rejects illusion and seeks what cannot be overturned. Time can be overturned — by perception, by fatigue, by culture, by memory, by the destruction of clocks. What cannot be overturned is the order of events. The world is not a timeline. It is a web of change.

When one accepts that time does not exist, a deep shift occurs in how existence is understood. The fear of “running out of time” vanishes, because there is no time to lose. What exists is only the body’s erosion and the events that still remain to unfold. The anxiety of growing old dissolves, because the body is not “aged” by time but worn by physical processes that arise from its structure. One does not dread the passage of years; one observes the condition of matter.
This understanding restores a stronger link to reality. A cracked stone is not “old.” It is fractured by pressure, temperature, and weight. A human body is not “forty years old.” It is shaped by nutrition, stress, illness, motion, and fate. Once the illusion of time disappears, humans stop attributing their state to an invisible force and begin to see the true causes around them.
History becomes simpler as well. Cultures are not separated by time but by the accumulation of events. The so-called Victorian era becomes a particular collection of human choices, inventions, and material conditions, not a distant point measured by clocks. The Roman world becomes a sequence of large construction projects, military actions, political transitions, and daily human lives. Nothing required time; everything required events.
A timeless worldview does not simplify reality. It clarifies it. It removes abstractions and leaves only what is real: bodies, matter, forces, motion, and consciousness observing them. Time becomes unnecessary, like an abandoned tool that once offered convenience but no longer reveals truth.

Humans speak of past and future as if they were places, distant regions of a temporal landscape. But the past is merely the set of events whose effects still shape the present. The future is the set of events that have not yet occurred. Neither exists as a realm. Both exist only as positions in the event sequence.
A man says, “The past is gone,” but the past is not gone. Its consequences are here: scars on the land, ruins in the earth, language shaped by countless mouths, customs shaped by long sequences of actions. The events remain present in their effects, not as floating moments behind us.
A man says, “The future awaits,” but the future is not “ahead.” It is not a container waiting to be filled. It is only the name given to the next set of events that matter will undergo. When those events occur, humans rename them “present.” When their effects remain, humans

rename them “past.” The entire structure stands upon human language, not upon cosmic architecture.
Remove language, and only events remain. What humans call “past” and “future” are only interpretations of sequences. They are helpful for storytelling and planning, but they do not describe the universe. The cosmos does not store the past behind it or the future ahead of it. It only manifests the state that exists now, and this state is nothing more than the result of all prior events.
Thus, past and future dissolve under examination. Only the unfolding of matter remains.

To live in a world without time is to live closer to reality. One sees that every event is complete in itself. The first event is that a hand rises; the second is that a cloud shifts. They are not separated by hours. They are separated by nothing more than the change between states. One sees that multiple events can arise at once — a car moves while a person steps forward, while wind shapes the grass. The world does not align itself into a single line of temporal flow. It moves as a vast field of simultaneous transformations.
In this view, even the mind becomes clearer. It stops trying to measure what cannot be found. It stops fearing what is imaginary. It becomes loyal to what the cosmos actually shows. Reality is the movement of matter, not the passage of time. Reality is the erosion of bodies, not aging. Reality is the sequence of events, not history unfolding through numbered intervals.
Clocks become artifacts of culture, not windows into truth. Calendars become organizational tools, not descriptions of the universe. Memory becomes a chain of events, not a catalogue of times. The world becomes simpler, sharper, more honest.

This book has shown that time is an illusion created by the human mind to assist in orientation, planning, and social coordination. The cosmos itself contains no such entity. What exists is the movement and transformation of matter in space. What exists is the order of events. A body appears, acts, wears out, and disappears. Another body emerges and continues the chain. These transitions require no time. They require only physical change. Events can be counted, but their numbering does not reveal time. Events can be sequenced, but their order does not create a timeline. Duration is felt differently by each person because it arises from the body’s condition, not from the world’s structure. History unfolds not through ages but through chains of actions and consequences. Clocks measure cycles of matter, not the flow of an independent dimension.
Thus the essence of the theory is clear:
Time does not exist in the universe. Only events exist. Only change exists. Only matter in motion exists.
This view aligns with the principle that reality must be described as it is, not as humans prefer it to be. When illusion is removed, only the natural order remains. The universe does not pass through time. It manifests itself through events. The logic recognizes this and lives within the unfolding of things without fear of “before” or “after.”

In a universe without time, two bodies meet at a single place not because they synchronize themselves with an invisible temporal flow, but because they follow agreed-upon patterns of movement through space. When two Earthborn decide to meet at a location, what they truly decide is this: each will move their body along a chosen sequence of events so that both sequences converge on the same physical point.

Yet without a shared reference, they would not know when the other will arrive. The world offers no natural markers for "when." It offers only the cycle of light and dark. Humans did not create this cycle, but they used it to build the tool called "time." By dividing daylight into segments and agreeing upon their numbering, they created a system that makes coordination possible.

Thus, when two people agree to meet "at midday," they are not invoking time as a real entity. They are referring to a shared belief about which part of the light cycle they will enter the meeting point. One may travel early; another may travel late. What matters is that both interpret the same light–dark pattern with the same symbolic divisions. These divisions are not part of the cosmos; they are part of human language.

The same applies at night. When one says, "I will arrive after dark," he does not point to a temporal dimension. He points to the physical state of the sky. Darkness exists. Light exists. Their alternation is a planetary movement, not the flow of time. Humans simply carve these movements into conceptual frames and call them "hours," "evening," or "dawn." These words make it easier for two bodies to align their paths.

Thus coordination should not be mistaken for proof of time. Two bodies meet because they move in certain ways according to agreed-upon markers. Time is only a symbolic map of the light-dark cycle, a tool for synchronization. The meeting itself is purely physical: two bodies occupy one point in space because each followed a chosen sequence of events to reach that point. No time intervened. Only movement did.

This reveals that even the most practical uses of time do not require time to exist. The universe provides cycles; humans provide names. The convergence of bodies requires motion; humans supply the agreements. Time is useful without being real, much like a compass is useful without altering the landscape. It helps humans coordinate their movements, but it does not create the meeting. The meeting happens through the world's laws alone.

Methods used in this work (Pages One–Six)

1) Mechanics by constraint, not clocks.

We begin with Jacobi's principle: the physically allowed histories are those that extremize a length-like action on configuration space. From this follows the Hamilton–Jacobi constraint, an equation linking momenta, potential, and total energy **without** introducing a time parameter. Change is narrated relationally: derivatives are taken *with respect to other changing quantities* ("how does F change as C changes?"), not with respect to t. Speeds are distance-over-distance, angles-over-distance—mutual paces between bodies.

2) Fields as exact/closed forms.

Electromagnetism is written with differential forms—$F = dA$, $dF = 0$, $d{*}F = J$. This is a static, global statement about what fields can exist alongside sources. Nothing evolves "in time"; instead, a permissible electromagnetic *configuration* satisfies these constraints everywhere.

3) Thermodynamics as geometry of state space.

Equilibrium is a property of measure on the energy surface: $S = k_B \ln \Omega$. Temperature, pressure, and chemical potentials are derivatives of entropy with respect to other state variables. Transport and kinetics are expressed per *odometer length*—how populations, concentrations, or structures change per unit of a chosen internal progress variable—rather than per unit time.

4) Quantum theory as a stationary constraint and conditional predictions.

The quantum state satisfies $(\hat{H} - E)|\Psi\rangle = 0$. Predictions are conditional: the probability for a given that c is observed is computed from projectors, not from a march in time. When narration is helpful, we pick an internal *clock-subsystem* C and write mutual-pace Schrödinger equations: derivatives with respect to a physical length or position readout of C, not with respect to t.

5) Gravity as constraints on 3-geometry; light by optical geometry.

General Relativity, in Hamiltonian clothing, is a pair of constraints on spatial geometry and its conjugate momenta. Light propagation is treated by conformal "optical" metrics: redshift and lensing are statements about ratios of wavelengths and deflection angles along null paths, all geometric and timeless in character.

6) Cosmology as scale relations.

Homogeneous, isotropic cosmology reduces to algebraic relations among the scale factor a, spatial curvature k, matter content, and Λ. Distances, redshifts, and luminosities are written as *scale-only* integrals and curvature functions. The universe's narrative is a relation among scales and densities, not a parade across an external clock.

Across these domains we use the same toolkit: **constraints, variational principles, relational derivatives, and internal paces**. The equations in the pages that follow never differentiate with respect to time; instead they correlate what can be observed with what else is observed—angles with lengths, fluxes with areas, phases with paths, densities with scales.

Purpose of this work

The purpose is twofold. First, **to clear the conceptual ground**: to show that the essence of physical law is constraint and relation, not chronology. Second, **to provide a working canon**—a compact set of equations and methods you can apply to real problems without ever invoking an external time variable. Doing so sharpens questions and often simplifies derivations: predictions become statements like *"when the radius is r, the angle is ϕ,"* or *"given this redshift, the angular size must be that,"* or *"conditioned on this readout of the internal odometer, the system's configuration has those probabilities."*

You will still be free to use clocks—just as you are free to use rulers, protractors, and spectrometers. But a clock is then recognized as **one instrument among many**, not the axis of the universe. In the pages ahead, we place clocks back where they belong: on the workbench, not in the ontology.

If the thesis rings austere, it is also liberating. Freed from the compulsion to invent a universal ticking, we attend to what the world actually presents: objects in motion, fields spread over space, structures that relate, persist, and wear. Physics is thereby returned to what is given and measured—relations among things—so that our descriptions are as lean, durable, and usable as the cosmos they aim to describe.

Page One — Timeless Foundations and Classical Mechanics

Begin with a different ontology. Reality is a set of admissible configurations q (positions of particles, field amplitudes, geometric data, etc.). A "history" is not a movie in time, but a chain of neighboring configurations that extremizes a length-like functional. No clocks appear; only constraints and a geometric rule that picks allowed chains.

The classical engine for this is Jacobi's principle. For a system with total energy E and potential $V(q)$, define the configuration-space line element

$$\mathrm{d}s \;=\; \sqrt{2\big(E - V(q)\big)}\,\sqrt{m_{ij}\,\mathrm{d}q^i\,\mathrm{d}q^j},$$

where m_{ij} is the mass metric (for N particles, m_{ij} is diagonal with entries $m_1, \ldots, m_N$). The actual chains of configurations are the geodesics of this metric: they make the action

$$S_J[q] \;=\; \int \mathrm{d}s$$

stationary. There is no t anywhere. All Newtonian trajectories are recovered as geodesics in this conformally weighted geometry on configuration space. "Duration" never appears; only "shape of change."

Equivalently, in Hamilton–Jacobi form you write a single time-free constraint for the principal function $S(q)$:

$$\frac{1}{2}\,m^{ij}\,\partial_i S\,\partial_j S \;+\; V(q) \;=\; E.$$

Momenta are $p_i = \partial_i S$. This one equation replaces $m\ddot{q} = -\nabla V$ and absorbs time into correlations among coordinates and momenta. Predictions become statements like "when the pendulum angle is θ, the radius of the bob's path and tension must satisfy …," not "$\theta(t)$."

A practical rule for differentiation without time is the relational derivative. Choose any monotonic "clock" variable $C(q,p)$ from within the system (for example, the angle of a steadily rotating flywheel, or the position of a free reference particle). With a single Hamiltonian constraint $H(q,p) = E$, the rate of change of any observable $F(q,p)$ with respect to this internal clock is

$$\frac{\mathrm{d}F}{\mathrm{d}C} \;=\; \frac{\{F,\,H\}}{\{C,\,H\}},$$

where $\{\cdot,\cdot\}$ is the Poisson bracket. No external t, only change-with-respect-to-change. If you dislike even naming a "clock," treat C as just another coordinate used to parametrize the chain; physics is invariant under reparametrizations.

To see this working, take three emblematic examples.

First, the harmonic oscillator with mass m and frequency ω. Standard dynamics uses $q'' + \omega^2 q = 0$. The timeless statement is the Hamilton–Jacobi constraint

$$\frac{1}{2m}\Big(\partial_q S\Big)^2 \;+\; \frac{1}{2}m\omega^2 q^2 \;=\; E,$$

from which $p(q) = \partial_q S = \pm\sqrt{2mE - m^2\omega^2 q^2}$. If you pick any internal monotone variable C (say, the coordinate x_c of a free particle of mass m_c used as a reference), then

$$\frac{\mathrm{d}q}{\mathrm{d}x_c} = \frac{\{q,H\}}{\{x_c,H\}} = \frac{p/m}{p_c/m_c} = \frac{m_c}{m}\,\frac{\pm\sqrt{2mE - m^2\omega^2 q^2}}{p_c}.$$

This is a first-order, time-free differential equation that correlates oscillator angle/extension directly with the change of your reference subsystem. Solve it to get q as a function of x_c, not of t. If you prefer no "clock" at all, you can characterize the entire chain implicitly by the curve in (q,p) space given by the energy ellipse $p^2/m + m\omega^2 q^2 = 2E$, which already encodes every measurable correlation of the oscillator.

Second, orbital motion under a central potential $V(r)$. The usual Kepler problem is defined without time by eliminating it analytically. Introduce $u(\phi) = 1/r$. The shape of allowed chains is determined by Binet's equation

$$\frac{\mathrm{d}^2 u}{\mathrm{d}\phi^2} + u = -\frac{1}{\ell^2 u^2} F\left(\frac{1}{u}\right), \quad \text{with} \quad \ell = \frac{L}{m}.$$

For Newtonian gravity $F(r) = -\frac{GMm}{r^2}$ this gives the conic

$$r(\phi) = \frac{\ell^2/(GM)}{1 + e\cos\phi},$$

an entirely time-free law that correctly predicts closed ellipses, precession when you perturb the law, and scattering angles in hyperbolic encounters. What "evolves" is just the angle ϕ along the chain of configurations; no t is needed to fix all observable relations like periapsis distance versus eccentricity.

Third, electromagnetism is naturally timeless when formulated on a four-dimensional manifold without privileging any coordinate as "time." Take the potential 1-form A and field strength 2-form $F = \mathrm{d}A$. Dynamics and sources are the two constraint equations

$$\mathrm{d}F = 0, \qquad \mathrm{d}{*F} = J,$$

derived by extremizing the action $S[A] = -\frac{1}{2}\int F \wedge *F + \int A \wedge *J$. No variable t appears anywhere; the entire electromagnetic "history" is a single block-solution of these coupled geometric constraints. If you later choose to slice that 4D solution by any parameter and call it "time," you can recover the familiar $\partial/\partial t$ Maxwell equations. But the fundamental statement needs no such slicing.

To compute without ever introducing t, you work with three tools. The Jacobi action gives you geodesics of change. The Hamilton–Jacobi constraint gives you algebraic relations between generalized coordinates and momenta on the admissible surface $H = E$. The relational derivative lets you describe how one subsystem's state changes relative to another's, using only Poisson brackets and the single constraint $H = E$. Together they form a complete calculus of change-without-time.

Objections are natural. "But what about duration, frequency, decay rates?" In this framework, "frequency" is the number of cycles per increment of some chosen internal variable; "rates" are ratios of Poisson brackets; "half-life" becomes the amount of configurational arc-length or clock-subsystem change required for a system to move from one macrostate region to another. Nothing essential is lost—only the metaphysical commitment to an external parameter is removed.

Page Two — Kinematics and Dynamics with Speed but No Time

Begin with an operational definition that never mentions clocks. Choose any reference object B whose spatial path carries a natural odometer: marked track length, wheel turns, ruler ticks—pure distance. For any body A, its **mutual speed** relative to B is the limit

$$v_{A|B} \;\equiv\; \frac{\mathrm{d}\ell_A}{\mathrm{d}\ell_B},$$

the ratio of infinitesimal arc lengths along their paths in ordinary 3-space. This $v_{A|B}$ is dimensionless and directly measurable: "how many meters A advances each time B advances one meter." You may similarly define an **angular speed** without time by

$$\omega_{A|B} \;\equiv\; \frac{\mathrm{d}\theta_A}{\mathrm{d}\ell_B},$$

the angle turned by A per meter advanced by B. No seconds, only space.

Dynamics enters through a single, timeless constraint: the energy surface. For a system with configuration q and canonical momenta p,

$$H(q,p) \;=\; T(p,q) + V(q) \;=\; E,$$

with kinetic metric $T = \tfrac{1}{2}\, m^{ij}(q)\, p_i p_j$. This one equation carves out the admissible states. Correlations among changing variables come from **relational differentiation**:

$$\frac{\mathrm{d}F}{\mathrm{d}C} \;=\; \frac{\{F,\,H\}}{\{C,\,H\}} \quad (\text{Poisson brackets}),$$

which says "how F changes per unit change of C" along the physical chain—never invoking an external t.

Now watch familiar laws fall out in time-free dress.

A free body in 3-space has $V = 0$, so $p^2 = 2mE$ is constant and the path is a straight line. If B is also free with momentum p_B, then

$$v_{A|B} \;=\; \frac{\mathrm{d}\ell_A}{\mathrm{d}\ell_B} = \frac{\{\,\ell_A, H\,\}}{\{\,\ell_B, H\,\}} = \frac{p_A/m_A}{p_B/m_B} = \frac{m_B}{m_A}\,\frac{\|p_A\|}{\|p_B\|},$$

a constant ratio of odometer ticks. "Uniform motion" means constant $v_{A|B}$, no clocks required.

In a uniform field (say a constant force F along x), write $V(x) = -Fx$. The timeless energy constraint gives

$$\frac{p(x)^2}{2m} + V(x) = E \quad \Rightarrow \quad p(x) = \pm\sqrt{2m\big(E + Fx\big)}.$$

Pick a free reference B with momentum p_B. The **Galilean law without time** is then

$$\frac{\mathrm{d}x}{\mathrm{d}\ell_B} = \frac{\{x, H\}}{\{\ell_B, H\}} = \frac{p(x)/m}{p_B/m_B} = \frac{m_B}{m}\,\frac{\pm\sqrt{2m(E+Fx)}}{\|p_B\|}.$$

Integrating this gives x as a function of the distance advanced by B. If you prefer a purely spatial invariant, eliminate even B and use the work–energy relation directly:

$$p(x)^2 - p(x_0)^2 = 2mF\,(x - x_0),$$

which is the traditional $v^2 = v_0^2 + 2a\Delta x$ with $v \equiv p/m$ but expressed entirely as a relation between momenta and distances. No time slips in.

The harmonic oscillator needs no time either. With $H = \frac{p^2}{2m} + \frac{1}{2}m\omega^2 q^2 = E$, the energy ellipse $p^2/m + m\omega^2 q^2 = 2E$ already encodes every observable correlation. Choosing any odometer C (for instance, ℓ_B of a free B), the oscillator's mutual speed is

$$\frac{\mathrm{d}q}{\mathrm{d}\ell_B} = \frac{\{q, H\}}{\{\ell_B, H\}} = \frac{(p/m)}{(p_B/m_B)} = \frac{m_B}{m}\,\frac{\pm\sqrt{2E/m - \omega^2 q^2}}{\|p_B\|}.$$

Solve to obtain $q(\ell_B)$, or stay fully parametric: the closed curve in (q, p) space is the whole "motion."

Central forces are naturally timeless through their shape equations. With conserved angular momentum L, Binet's equation,

$$\frac{\mathrm{d}^2u}{\mathrm{d}\phi^2} + u = -\frac{1}{\ell^2 u^2}\,F\!\left(\frac{1}{u}\right), \quad u = \frac{1}{r},\ \ell = \frac{L}{m},$$

determines the path $r(\phi)$ outright. For Newtonian gravity $F(r) = -GMm/r^2$, you get conics

$$r(\phi) = \frac{\ell^2/(GM)}{1 + e\cos\phi},$$

fixing periapsis, scattering angles, and impact parameters with no reference to a ticking variable. If you want an angular **pace** relative to the odometer ℓ_B,

$$\frac{\mathrm{d}\phi}{\mathrm{d}\ell_B} = \frac{\{\phi, H\}}{\{\ell_B, H\}} = \frac{L/(mr^2)}{\|p_B\|/m_B} = \frac{m_B L}{\|p_B\|\, mr^2},$$

which you can integrate along the conic if you need "how far around" per meter advanced by B.

Collisions are pure constraints at a junction of the chain. For an elastic encounter of two bodies in 1D, you never need time; impose

$$p_1 + p_2 = p_1' + p_2', \qquad \frac{p_1^2}{2m_1} + \frac{p_2^2}{2m_2} = \frac{p_1'^2}{2m_1} + \frac{p_2'^2}{2m_2},$$

and solve for the outgoing momenta (p_1', p_2'). In 3D add the directional constraints with the scattering geometry. "Before" and "after" are just two neighboring nodes of the configuration chain consistent with these algebraic relations.

Rigid rotations can be treated without angular time. For a body with fixed r and angular momentum L, the **rotation per meter of** B is the $\omega_{A|B}$ above; the energy reads $E = \frac{L^2}{2I} + V$, so changing orientation correlates directly with changes in other distances you measure. Torque laws are similarly constraint statements: if a conservative torque comes from $V(\theta)$, then on the admissible surface $L^2 = 2I(E - V(\theta))$, giving the purely spatial differential

$$\frac{\mathrm{d}\theta}{\mathrm{d}\ell_B} = \frac{L/I}{\|p_B\|/m_B} = \frac{m_B}{\|p_B\|}\,\frac{\sqrt{2(E-V(\theta))}}{\sqrt{I}}.$$

Even continuum "flows" can be phrased without t by working with material coordinates. Label each parcel by a reference position X in a notional reference configuration, and let $\chi : X \mapsto x$ be the placement map along the physical chain. The usual velocity field is replaced by the **mutual speed field**

$$V_{|B}(x) \;\equiv\; \left.\frac{\partial \chi(X)}{\partial \ell_B}\right|_{X:\,\chi(X)=x},$$

and balance laws become constraints on how volumes and forces correlate under increments of ℓ_B. For example, incompressibility is simply $\det(\partial\chi/\partial X) = 1$, a purely geometric condition. If you insist on "rates," they are always ratios like $\partial(\,\cdot\,)/\partial\ell_B$.

Two clarifications secure the frame. First, "speed" here is not distance-per-time but distance-per-distance, which is exactly what one measures when synchronizing two moving odometers. If someone later fixes a conventional conversion between ℓ_B and "seconds," that is a gauge choice, not a necessity. Second, nothing probabilistic or predictive is lost. The energy surface $H = E$, plus constraints from symmetries and potentials, already determines the allowed chains; relational derivatives tell you how one observable changes when another changes. Precision predictions are made as equations among distances, momenta, and angles —no metaphysical time constant sneaks in.

Page Three — Thermodynamics & Statistical Mechanics Without Time

Equilibrium thermodynamics is already timeless. A macrostate is a point $X = (E, V, N_1, \dots)$ in state space, and entropy is a geometric functional of the admissible micro-configurations. On phase space Γ with Hamiltonian $H(q,p)$, the energy surface is $\Sigma_E = \{(q,p) \in \Gamma : H = E\}$. Use the microcanonical measure $\mathrm{d}\mu_E = \delta(H - E)\,\mathrm{d}q\,\mathrm{d}p$. The entropy is

$$S(E,V,N) \;=\; k_B \ln \Omega(E,V,N), \qquad \Omega = \int_{\Sigma_E} \mathrm{d}\mu_E .$$

No clocks appear. Temperature, pressure, and chemical potentials are intrinsic derivatives of this count:

$$\frac{1}{T} = \left(\frac{\partial S}{\partial E}\right)_{V,N}, \qquad \frac{P}{T} = \left(\frac{\partial S}{\partial V}\right)_{E,N}, \qquad -\frac{\mu_i}{T} = \left(\frac{\partial S}{\partial N_i}\right)_{E,V,N_{j\neq i}} .$$

All Maxwell relations follow from the exactness of $\mathrm{d}S$. Equilibrium predictions are purely constraint statements among $(E, V, N, \dots)$, not evolutions in t.

Processes can be drawn as curves through state space, ordered not by time but by any monotone internal parameter of change. A natural choice is the configurational arc-length s from Jacobi's metric on configuration space (Page One), or the odometer distance ℓ_B carried by a chosen reference body B. The Second Law becomes a selection rule on admissible curves: for an isolated system, typical micro-chains that pass through given macrostates satisfy $\mathrm{d}S \geq 0$ when ordered by any increasing internal parameter (such as s or ℓ_B). Irreversibility is thus not "arrow of time," but measure-theoretic typicality of chains that climb the entropy gradient.

Contact with reservoirs is timeless too. When a subsystem A weakly touches a vast bath R, the weight of a microstate of A with energy E_A is proportional to the bath's multiplicity at $E_R = E_{\mathrm{tot}} - E_A$:

$$w(E_A) \propto \exp[S_R(E_{\text{tot}} - E_A)/k_B] \approx \exp(-\beta E_A)\,, \quad \beta := \left.\frac{\partial S_R}{\partial E_R}\right|_{E_{\text{tot}}}.$$

The canonical distribution is therefore a purely geometric shadow of the bath's entropy slope; β is not "inverse temperature in seconds," it's the derivative of counting. Free energies are Legendre transforms of S, and minimum/maximum principles are again stationary-geometry statements, not dynamics-in-time.

Transport and "rates" admit a clean rewrite. Consider diffusion. Empirically define a **diffusivity per odometer distance** by a law of large spatial numbers:

$$\tilde{D} \;=\; \lim_{\Delta \ell_B \to 0} \frac{\langle \Delta x^2 \rangle}{2d\,\Delta \ell_B}.$$

This is measured by correlating mean-squared displacement with how far the reference body B has traveled —no seconds, only meters of B. The familiar Fick relations become either steady constraints,

$$\mathbf{J} = -D\,\nabla \rho, \qquad \nabla \cdot \mathbf{J} = 0,$$

or, if you insist on an ordered chain, a **mutual-pace** diffusion equation

$$\frac{\partial \rho}{\partial \ell_B} \;=\; \tilde{D}\,\nabla^2 \rho,$$

where $\tilde{D}$ is your operational constant "per meter of B". Predictions about spreading profiles and boundary layers follow exactly as in the timed version, because what experiments really fix are shapes and ratios, not the metaphysical label on the ordering parameter.

Heat conduction is similar. Fourier's law $\mathbf{J}_Q = -\kappa \nabla T$ is timeless; steady conduction solves $\nabla \cdot (\kappa \nabla T) = 0$. If you want an ordered transformation between two temperature fields $(T_0 \to T_1)$, you can write a mutual-pace heat equation,

$$\frac{\partial T}{\partial \ell_B} \;=\; \tilde{\alpha}\,\nabla^2 T, \qquad \tilde{\alpha} := \frac{\kappa}{\rho c}\,\frac{\mathrm{d}t}{\mathrm{d}\ell_B},$$

and then treat $\tilde{\alpha}$ as an empirically calibrated constant "per meter of B". Or you simply solve the boundary-value problem and skip ordering altogether; most practical heat problems are steady.

Kinetic theory and Liouville's theorem are most elegant in timeless form. Let X_H be the Hamiltonian vector field on Γ. The **Liouville equation without time** is just

$$\mathcal{L}_{X_H} f \;=\; 0,$$

the statement that the density $f(q,p)$ is invariant along the Hamiltonian flow on Σ_E. Coarse-graining $f \mapsto \bar{f}$ generates a monotone H-functional along typical ordered chains, giving Boltzmann's arrow as a property of measures and partitions, not of a clock. Collisions are local constraints on incoming and outgoing momentum configurations; the collision integral is a balance on measures of pre- and post-collision sets at a contact surface in configuration space. Where textbooks write a "collision rate," you can define a **collision propensity per odometer length** by counting the expected number of collision surfaces crossed per unit ℓ_B along typical micro-chains through a dilute gas. The algebra of cross-sections is unchanged.

Chemical kinetics can be freed from time by replacing "first-order rate k" with a **hazard per odometer length** κ. For an ensemble of identical unstable objects, define

$$\kappa \;=\; \lim_{\Delta\ell_B \to 0} \frac{\Pr(\text{react/decay in } \Delta\ell_B \mid \text{survive at } \ell_B)}{\Delta \ell_B}.$$

Then the survival along the ordered chain is $S(\ell_B) = e^{-\kappa \ell_B}$, and the "half-length" is $\ell_{1/2} = \ln 2/\kappa$. Laboratory protocols that once reported half-lives now simply report half-lengths relative to a standard odometer process (a conveyor belt, a rotating wheel, the path of a reference particle beam). Nothing observable is lost; only the metaphysical veneer is changed.

Non-equilibrium thermodynamics becomes geometry of steepest ascent. Equip the manifold of macrostates with a thermodynamic metric, for instance the Ruppeiner metric $g_{ij} = -\partial_i \partial_j S(X)$. A **process curve** $X(\lambda)$ for an isolated system satisfies two timeless conditions: it is tangent to the entropy gradient $\dot{X}^i \propto g^{ij}\partial_j S$, and it obeys the conservation constraints (energy, particle numbers, etc.). The parameter λ can be pure entropy-arc length $\mathrm{d}\sigma^2 = g_{ij}\mathrm{d}X^i \mathrm{d}X^j$ or your odometer ℓ_B. Either way, "relaxation" means approaching the entropy maximum; the theory predicts endpoints and intermediate shapes without appointing a universal clock.

Finally, macroscopic balances are timeless identities. The first law reads $\mathrm{d}E = \delta Q - \delta W$ as a differential along any admissible change; the second law adds $\mathrm{d}S \geq \delta Q/T$. Constitutive relations (elasticity, plasticity, viscosity) can be posed as inequalities and potentials on strain, stress, and configurational measures; steady flows solve elliptic constraints, while ordered transformations can be paced by ℓ_B if you want to narrate the change rather than just compute the endpoints.

Page Four — Quantum Theory Without Time

Begin with a single structural rule: physical states are those vectors $|\Psi\rangle$ in the kinematic Hilbert space that satisfy a constraint,

$$(\hat{H} - E)\,|\Psi\rangle = 0,$$

or, by shifting the zero, $\hat{H}|\Psi\rangle = 0$. This is the quantum echo of Jacobi's timeless mechanics: no "evolution parameter," only a stationary constraint on admissible configurations. Predictions are extracted as conditional correlations between parts of $|\Psi\rangle$, never as $\Psi(\cdot, t)$.

The Born rule is recast relationally. For two subsystems A and C (with C playing the role of a reference odometer, wheel, pointer, rotor, or any monotonically advancing spatial variable), the probability of finding A in a region a **given** that C is in a region c is

$$\mathsf{P}(a\,|\,c) \;=\; \frac{\big\|\Pi_a\,\Pi_c\,|\Psi\rangle\big\|^2}{\big\|\Pi_c\,|\Psi\rangle\big\|^2}.$$

No clocks: only joint geometry encoded in $|\Psi\rangle$ and the projectors Π.

To speak about "change-with-respect-to-change," use the relational Heisenberg equation. For any observable $\hat{F}$ and any chosen internal "pace" variable $\hat{C}$,

$$\frac{\mathrm{d}\langle \hat{F}\rangle}{\mathrm{d}C} = \frac{\big\langle \frac{i}{\hbar}\,[\hat{H}, \hat{F}]\big\rangle}{\big\langle \frac{i}{\hbar}\,[\hat{H}, \hat{C}]\big\rangle},$$

evaluated on the constrained sector of $|\Psi\rangle$. The denominator is the generator-induced advance of C; the ratio tells you how F shifts **per unit advance of** C. The same relation can be used at the operator level whenever $[\hat{H}, \hat{C}]$ is invertible on the relevant sector.

A particularly concrete and useful choice for C is a **spatial odometer**. Let C be the position operator $\hat{x}_B$ of a free reference particle B whose momentum has a sharp sign so that $\hat{x}_B$ is monotone along the physical chains. For a composite $A{+}B$ in a stationary state $|\Psi\rangle$ with $(\hat{H}_A + \hat{H}_B + \hat{H}_{\text{int}} - E)|\Psi\rangle = 0$, the conditional state of A **when** B is at x_B is

$$|\psi_A(x_B)\rangle \;\propto\; \langle x_B|\Psi\rangle,$$

and it obeys a **mutual-pace Schrödinger equation** with no time variable:

$$i\hbar\,\frac{\partial}{\partial x_B}\,|\psi_A(x_B)\rangle \;=\; \big(\nu_B^{-1}\,\hat{H}_A + \nu_B^{-1}\,\hat{H}_{\text{int}}^{(A)}\big)\,|\psi_A(x_B)\rangle, \qquad \nu_B \;:=\; \frac{i}{\hbar}\,[\hat{H}_B, \hat{x}_B] \;=\; \frac{\hat{p}_B}{m_B}.$$

Here ν_B is the reference **speed operator**—the generator-defined advance of x_B per unit "Hamiltonian push." If B is a narrow wavepacket with positive momentum p_B, you may replace ν_B by the c-number $v_B = p_B/m_B$. This equation narrates how A's state changes **per meter advanced by** the reference B. Nothing in it presumes an external t.

The stationary (energy-fixed) wave equation needs no time either. For a single particle with potential V,

$$\Big(-\frac{\hbar^2}{2m}\nabla^2 + V(\mathbf{r})\Big)\psi(\mathbf{r}) \;=\; E\,\psi(\mathbf{r}).$$

This already contains scattering, bound spectra, and tunneling. Transmission through a barrier, phase shifts, and cross-sections are all determined at fixed E by matching spatial solutions; laboratory "dwell times" are merely re-descriptions of spatial phase accumulation divided by a chosen internal pace.

The path-integral formulation becomes especially transparent. The amplitude between two configurations q_1 and q_2 **at fixed energy** E is the resolvent kernel,

$$G_E(q_2, q_1) \;=\; \big\langle q_2\big|\frac{1}{E - \hat{H} + i0}\big|q_1\big\rangle \;=\; \frac{i}{\hbar}\int_0^\infty \mathrm{d}N\,\big\langle q_2\big|e^{-\frac{i}{\hbar}N(\hat{H}-E)}\big|q_1\big\rangle,$$

or, semiclassically, a sum over configuration-space chains weighted by the **Jacobi action**

$$S_J[q] \;=\; \int \sqrt{2\big(E-V(q)\big)}\,\sqrt{m_{ij}\,\mathrm{d}q^i\,\mathrm{d}q^j}, \qquad \mathcal{A}(q_2,q_1) \;\propto\; \sum_{\text{paths}} \exp\!\Big(\tfrac{i}{\hbar}S_J[q]\Big)\,.$$

No parameterization of the chain is physical; reparameterizations are gauge. What matters is geometrical arc length in configuration space and the energy level you condition on.

Scattering is entirely timeless when done at fixed energy. Solve the stationary equation with outgoing boundary conditions to get the T-matrix and the S-matrix $S(E)$. The differential cross-section depends on spatial asymptotics of $\psi_E(\mathbf{r})$, not on a clock. When experiments count events "per second," they are really reporting a **flux per length of the reference beam** times a geometric probability that a particle crosses a given detector surface. One can just as well report "events per meter of conveyor travel" and obtain the same $S(E)$.

Decay and reaction "rates" can be rewritten as **hazards per odometer length**. In perturbation theory, Fermi's Golden Rule reads $\Gamma = \frac{2\pi}{\hbar}|M_{i\to f}|^2\rho(E)$ in timed language. Replace it by

$$\kappa \;=\; \frac{\Gamma}{v_C} \;=\; \frac{2\pi}{\hbar}\,\frac{|M_{i\to f}|^2\rho(E)}{v_C},$$

where v_C is the (operator or sharp value of the) pace of your chosen clock-coordinate C. Survival along the ordered chain of C is $S(C) = e^{-\kappa C}$, and the "half-length" is $C_{1/2} = \ln 2/\kappa$. Experiments that once quoted a half-life can instead quote a half-distance of a belt, a beam path, or a rotor angle swept.

Probability currents are naturally relational. For a two-particle stationary wave $\Psi(\mathbf{r}_A,\mathbf{r}_B)$, define the individual spatial currents $\mathbf{j}_A = \frac{\hbar}{m_A}\,\mathrm{Im}\,\Psi^*\nabla_A\Psi$ and $\mathbf{j}_B = \frac{\hbar}{m_B}\,\mathrm{Im}\,\Psi^*\nabla_B\Psi$. The **mutual pace of the centroid** of A with respect to the odometer of B is then

$$\frac{\mathrm{d}\langle \mathbf{r}_A\rangle}{\mathrm{d}\ell_B} \;=\; \frac{\int \mathbf{r}_A\,(\nabla_B\!\cdot\!\mathbf{j}_B)\,\mathrm{d}^3r_A\,\mathrm{d}^3r_B}{\int (\nabla_B\!\cdot\!\mathbf{j}_B)\,\mathrm{d}^3r_A\,\mathrm{d}^3r_B} \;=\; \frac{\int \mathbf{j}_A\cdot\mathrm{d}\mathbf{S}}{\int \mathbf{j}_B\cdot\mathrm{d}\mathbf{S}},$$

expressed purely as a ratio of spatial fluxes through a chosen detector surface. What advances is distance on a meter or angle on a wheel; the quotient is dimensionless and observable.

Decoherence and records do not require time either. Split the world into a pointer P, a system S, and an environment E. A single stationary $|\Psi\rangle$ contains branches $|s_i\rangle \otimes |p_i\rangle \otimes |e_i\rangle$ with near-orthogonal e_i after a spatial interaction. The suppression of interference between macroscopically distinct pointer configurations is controlled by the **decoherence length**—the spatial separation required for $\langle e_i|e_j\rangle$ to become negligible. What textbooks call a "decoherence time" is simply the decoherence length divided by an arbitrary choice of pace; the physics is the geometry of overlaps in configuration space. "Collapse" is nothing but Bayesian conditioning: upon learning that $P \in p_k$, you update to the normalized $\Pi_{p_k}|\Psi\rangle$.

Spin and internal degrees are treated the same way. A Stern–Gerlach device correlates spin with spatial separation. The stationary solution downstream is a superposition of two spatial lobes carrying spin-up and spin-down. Observing which lobe your odometer enters conditions the spin state without any reference to t.

Relativistic quantum fields fit this pattern when stated in covariant form. The classical electromagnetic field already satisfied $\mathrm{d}F = 0,\ \mathrm{d}{*}F = J$ as timeless constraints. Quantization by the path integral integrates over all 4-geometries of the field A on a spacetime block; no preferred foliation is needed. If one wants an ordered narration, pick any monotone geometric variable (proper length along a chosen rod, area swept by a reference sheet, angle of a rotor) and form relational Heisenberg equations with that variable. The S-matrix remains a statement at fixed asymptotic momenta and polarizations.

Page Five — Gravity & Cosmology Without Time

General Relativity already carries the seed of timelessness: its true equations are constraints on 3-geometry, not evolution in a universal clock. Let $\gamma_{ij}(x)$ be a spatial metric, $\pi^{ij}(x)$ its canonical momentum, and $\sqrt{\gamma} = \sqrt{\det \gamma}$. The physical configurations are those satisfying the **momentum (diffeomorphism) constraints**

$$\mathcal{H}_i \;=\; -2\,\nabla_j \pi^j{}_i \;+\; \mathcal{H}_i^{(\mathrm{matt})} \;=\; 0,$$

and the single **Hamiltonian constraint**

$$\mathcal{H} \;=\; \frac{1}{\sqrt{\gamma}}\big(\pi^{ij}\pi_{ij} - \tfrac{1}{2}\pi^2\big) \;-\; \sqrt{\gamma}\,\big(R^{(3)} - 2\Lambda\big) \;+\; \mathcal{H}^{(\mathrm{matt})} \;=\; 0.$$

No t appears; the world is a chain of neighboring 3-geometries γ_{ij} and matter data that live on this constraint surface. All "change" is correlation along that chain.

You can build GR from a **Jacobi-type action** (Baierlein–Sharp–Wheeler form) that has no lapse, no time:

$$S_{\mathrm{BSW}} \;=\; \int \mathrm{d}\lambda \int \mathrm{d}^3x\; \sqrt{\gamma}\;\sqrt{R^{(3)} - 2\Lambda + \rho_{\mathrm{matt}}}\;\sqrt{G^{ijkl}\big(\dot{\gamma}_{ij} - \mathcal{L}_\xi \gamma_{ij}\big)\big(\dot{\gamma}_{kl} - \mathcal{L}_\xi \gamma_{kl}\big)}.$$

Here G^{ijkl} is the DeWitt supermetric, $\mathcal{L}_\xi$ removes pure relabelings of points (best matching), and the dot $\dot{}$ is **any** parametrization of the chain—pure gauge. Extremals of this functional are the physical chains. That is gravity without a clock.

To "differentiate" one observable with respect to another, use the same relational rule as before but now on **superspace** (the space of 3-geometries). For any functionals $F[\gamma,\pi]$ and $C[\gamma,\pi]$,

$$\frac{\mathrm{d}F}{\mathrm{d}C} \;=\; \frac{\{F,\; H_{\mathrm{tot}}\}}{\{C,\; H_{\mathrm{tot}}\}} \quad \text{with} \quad H_{\mathrm{tot}} = \int \mathrm{d}^3x\,\big(N\,\mathcal{H} + N^i \mathcal{H}_i\big).$$

Picking C is choosing a **pace variable** drawn from within the world—e.g., the total 3-volume $V = \int \sqrt{\gamma}\,\mathrm{d}^3x$, the length of a specific geodesic, the angle of a cosmic rotor, or the position x_B of a "reference dust" body. No external seconds are needed: all "rates" become ratios $\mathrm{d}F/\mathrm{d}C$.

Light, redshift, and lensing are purely spatial when phrased via **optical geometry**. In any static field with lapse $N(\mathbf{x})$ and spatial metric γ_{ij}, null rays are geodesics of the **optical metric**

$$\gamma_{ij}^{\mathrm{opt}} \;=\; N^{-2}(\mathbf{x})\,\gamma_{ij},$$

so lensing angles, multiple images, and "Shapiro delay" are statements about the extremal **spatial** path length $\int \sqrt{\gamma_{ij}^{\mathrm{opt}}\,\mathrm{d}x^i \mathrm{d}x^j}$. Gravitational redshift is the purely spatial wavelength ratio

$$\frac{\lambda_{\mathrm{obs}}}{\lambda_{\mathrm{em}}} \;=\; \frac{N(\mathrm{em})}{N(\mathrm{obs})},$$

a relation between two places along a single ray; no ticking variable intrudes. In weak fields, the light-deflection shape law remains

$$\alpha(b) \;\approx\; \frac{4GM}{b\,c^2},$$

which you may rewrite in geometrized units $c=1$ as a dimensionless bend versus the **impact length** b. The constant c here is merely a historical conversion; our formalism never used time to begin with.

Planetary orbits become **shape laws**. In Schwarzschild geometry, eliminate any parametrization and write the orbit equation directly for $u(\phi)=1/r$:

$$\frac{\mathrm{d}^2u}{\mathrm{d}\phi^2} + u \;=\; \frac{GM}{\ell^2} \;+\; 3\,GM\,u^2,$$

a pure spatial relation predicting the famous perihelion advance $\Delta\phi \approx \frac{6\pi GM}{a(1-e^2)c^2}$ per loop—an **angle per loop**, not per unit time.

Cosmology is cleanest in minisuperspace, where homogeneity and isotropy reduce the 3-geometry to a single spatial **scale** a multiplying a unit-curvature metric $\tilde{\gamma}_{ij}$. The Hamiltonian constraint becomes a timeless algebraic surface in (a, p_a):

$$\mathcal{H}_{\mathrm{FRW}} \;=\; -\frac{p_a^2}{12a} \;-\; 3k\,a \;+\; \Lambda a^3 \;+\; 8\pi G\,\rho(a)\,a^3 \;=\; 0,$$

with $k \in \{-1, 0, +1\}$ and matter encoded by its **density as a function of scale**, e.g.

$$\rho(a) = \sum_j \rho_{j*}\, a^{-3(1+w_j)} \quad (\text{dust } w{=}0,\ \text{radiation } w{=}1/3,\ \text{vacuum } w{=}{-}1).$$

This one constraint already fixes all **admissible** pairs (a, p_a); a cosmic "history" is a chain along this surface. Redshift is purely geometric:

$$1 + z \;=\; \frac{a_{\mathrm{obs}}}{a_{\mathrm{em}}},$$

a ratio of spatial scales of rulers and photon wavelengths measured at two locations connected by a null spatial path in the optical metric.

If you want a **pace** for narration, take the total spatial volume $V \propto a^3$ or the odometer of a co-moving "dust" reference B. Then cosmological change is told as

$$\frac{\mathrm{d}a}{\mathrm{d}C} \;=\; \frac{\{a, \mathcal{H}_{\mathrm{FRW}}\}}{\{C, \mathcal{H}_{\mathrm{FRW}}\}}, \qquad \frac{\mathrm{d}\ln a}{\mathrm{d}C} \;=\; \frac{-p_a/(6a^2)}{\{C, \mathcal{H}_{\mathrm{FRW}}\}},$$

a **mutual Hubble pace** that never calls upon seconds. Nearby galaxies then satisfy a **local Hubble law in pace form**,

$$z \;\approx\; \Big(\frac{\mathrm{d}\ln a}{\mathrm{d}C}\Big)_{*} \Delta C,$$

e.g., "redshift per meter of the lab conveyor" or "per turn of a rotor," depending on your chosen C. Observers may, by convention, convert ΔC into "years," but the physics is already complete without it.

Structure growth is equally geometric. For scalar density contrast $\delta(\mathbf{x})$ in a flat FRW background, the standard growth equation becomes a **mutual-pace** equation once you order by a (a purely spatial scale):

$$\frac{\mathrm{d}^2\delta}{\mathrm{d}(\ln a)^2} + \Big(2 + \Xi(a)\Big)\frac{\mathrm{d}\delta}{\mathrm{d}(\ln a)} - \frac{3}{2}\,\Omega_m(a)\,\delta \;=\; 0,$$

where $\Omega_m(a) = \frac{8\pi G\rho_m(a)}{3H_*^2(a)}$ and $\Xi(a)$ encodes whatever gravitational model you choose. Here $H_*(a)$ is **not** a time derivative; it is the algebraic object you get when you rewrite the FRW constraint as $H_*^2(a) = \frac{8\pi G}{3}\rho(a) + \frac{\Lambda}{3} - \frac{k}{a^2}$. It is a function of **scale only**, used as a shorthand inside the constraint; no clocks are required to compute growth, lensing kernels, or distance moduli.

All standard observables convert cleanly:

- **Perihelion advance** is an angle per orbital loop, derived from the spatial orbit equation.
- **Gravitational redshift** is a wavelength ratio along a static optical path.
- **Shapiro "delay"** is an **excess optical path length** $\Delta\ell$ predicted by the optical metric near mass.
- **Cosmic distances** are geometric functionals of the optical metric. For FRW,

$$D_A(z) \;=\; \frac{S_k\big(\chi(z)\big)}{1+z}, \qquad \chi(z) \;=\; \int_{a_{\rm em}}^{a_{\rm obs}} \frac{\mathrm{d}a}{a^2\,H_*(a)},$$

with $S_k(\chi) = \{\sin\chi,\ \chi,\ \sinh\chi\}$. The integral is over **scale** only; it is a shape functional, not a clock integral.

For practical narration, choose a **universal, physical odometer** C. Good choices are: the length traveled by a freely falling reference lattice ("dust rods"), the accumulated 3-volume V, or the angle swept by a rigid cosmic rotor anchored to your lab. Then every "rate" becomes a ratio $\mathrm{d}(\cdot)/\mathrm{d}C$. Atomic clocks, if you keep them, are just specialized odometers whose "ticks" are spatial periods of a bound-state standing wave; their usefulness does not grant metaphysical reality to "time."

Two advanced tools round out the picture. First, **shape dynamics** recasts GR so that the fundamental degrees of freedom are the conformal "shapes" of 3-space, $\bar\gamma_{ij} = \gamma^{-1/3}\gamma_{ij}$, plus a global scale. The constraints reduce to a single elliptic **Lichnerowicz–York equation** for the conformal factor ϕ:

$$-8\,\Delta\phi + R^{(3)}\phi - \bar A_{ij}\bar A^{ij}\,\phi^{-7} + \tfrac{2}{3}\,\tau^2\,\phi^5 - 16\pi G\,\rho\,\phi^{-3} = 0,$$

with momentum constraints solved by a transverse–traceless $\bar A_{ij}$. The parameter τ is a global mean curvature, a geometric label—not a time. Second, **relational geodesy**: matter follows spatial geodesics of the physical 3-geometry (or the optical metric for light), so all "motion" reduces to curves of extremal spatial length with appropriate effective indices. That computes lensing, orbits, deflections, and interference without a single t.

Page Six — Observational Dictionary (Timeless)

Begin with a single rule for "pace." Pick an internal odometer C: a traversed length ℓ_B of a reference body B, an angle swept by a rotor, a counted number of fringes on an interferometer, a baseline length in a parallax triangle, or the scale a of a homogeneous 3-geometry. Every "rate" becomes a ratio $\mathrm{d}(\cdot)/\mathrm{d}C$. When no narration is needed, solve the appropriate **spatial** boundary-value problem in one shot.

Perihelion precession is an angle per loop. In Schwarzschild geometry, eliminating all parameterization yields

$$\frac{\mathrm{d}^2u}{\mathrm{d}\phi^2} + u = \frac{GM}{\ell^2} + 3GM\,u^2, \qquad u = \frac{1}{r},\ \ \ell = \frac{L}{m}.$$

Integrate once around the orbit and read off the excess azimuth

$$\Delta\phi \approx \frac{6\pi GM}{a(1-e^2)c^2},$$

a **pure angle** gained per closed spatial loop; no clocks, only the shape of the curve in the central field.

Gravitational lensing is geometry in the **optical metric**. For any static spacetime with lapse $N(\mathbf{x})$ and spatial metric γ_{ij}, light follows geodesics of

$$\gamma^{\mathrm{opt}}_{ij} = N^{-2}\gamma_{ij},$$

so deflection angles, image positions, and "delays" are computed as differences of **optical path lengths**

$$\ell_{\mathrm{opt}} = \int \sqrt{\gamma^{\mathrm{opt}}_{ij}\,\mathrm{d}x^i \mathrm{d}x^j}.$$

Where textbooks speak of "Shapiro time delay," you compute an **excess path length** $\Delta\ell_{\mathrm{opt}}$ between the bent and the flat ray. The thin-lens relation is the same triangle,

$$\boldsymbol{\beta} = \boldsymbol{\theta} - \frac{D_{ds}}{D_s}\,\boldsymbol{\alpha}(\boldsymbol{\theta}),$$

with D's the usual angular-diameter distances defined below—entirely spatial functionals.

Spectroscopy never needed a clock: a spectrograph measures **wavelengths**. The redshift is the spatial ratio

$$1 + z = \frac{\lambda_{\rm obs}}{\lambda_{\rm em}}.$$

In special relativity for longitudinal motion this is $1 + z = e^{\chi}$, where χ is the **rapidity** (a hyperbolic angle). Thus $\chi = \ln(1 + z)$ is your kinematic parameter—an angle in Minkowski geometry—extracted from pure wavelength ratios. In a static gravitational field,

$$\frac{\lambda_{\rm obs}}{\lambda_{\rm em}} = \frac{N(\rm em)}{N(\rm obs)},$$

again a ratio of spatial lapse factors along one ray in the optical metric.

Distance ladder pieces are all geometric. **Parallax** uses a known baseline B and an angle π: distance $D = B/\pi$. **Standard rulers** (e.g., BAO) give you comoving length $r_\star$ seen under angles θ and redshift separations Δz, hence

$$D_A(z) = \frac{r_\star}{\theta}, \qquad D_\parallel(z) = \frac{r_\star}{\Delta z}\,\frac{\mathrm{d}\chi}{\mathrm{d}\ln(1+z)},$$

$$\chi(z) \;=\; \int_{a_{\rm em}}^{a_{\rm obs}} \frac{\mathrm{d}a}{a^2\,H_*(a)}\,.$$

$$H_*^2(a) \;=\; \frac{8\pi G}{3}\,\rho(a) \;+\; \frac{\Lambda}{3} \;-\; \frac{k}{a^2}\,.$$

Etherington's reciprocity is purely geometric,

$$D_L(z) = (1+z)^2 D_A(z),$$

so supernova "standard candles" can be reduced to counting spatial wavecrests and detected energy per crest across an aperture; any lab conversion from "counts per meter of chopper advance" to "watts" is a convenience, not a necessity.

Radial-velocity fields and redshift-space distortions are stated without clocks. Peculiar flows are just patterns in $\delta z(\hat{\mathbf{n}})$ across the sky. The Kaiser relation between anisotropic clustering and the growth factor is expressible directly in terms of $\mathrm{d}\delta/\mathrm{d}\ln a$ as in Page Five, with $\ln a$ a **scale label**, not a time.

Gravitational redshift tests are ratios of wavelengths and lapses. Pound–Rebka becomes "count the number of crests added to the photon as it climbs a spatial lapse gradient," i.e. compare λ at two heights; the prediction is the same exponent of the Newtonian potential difference to first order.

Interferometry is naturally timeless. A Michelson interferometer reports a **phase** shift,

$$\Delta\varphi = \frac{2\pi}{\lambda_{\text{laser}}}\,\Delta(2L),$$

a pure ratio of lengths: "how many laser wavelengths fit in the round trip." Every metrology protocol built on fringes is already distance-over-distance; the instrument's readout versus a movable mirror provides your odometer C in fringe counts.

Gravitational-wave detectors measure **strain**, a dimensionless length ratio. A passing wave changes arm lengths $L \to L + \delta L$ with $h \sim 2\,\delta L/L$; the detector output is

$$\Delta\varphi \approx \frac{2\pi}{\lambda_{\text{laser}}}\,h\,L,$$

$$\Delta\varphi \approx \frac{2\pi}{\lambda_{\text{laser}}}\, h\, L,$$

a phase purely proportional to a **spatial** deformation. The "chirp" is told without time by watching how the **phase per meter of laboratory odometer** changes as the Earth rotates or as you sweep the analysis window across the recorded interference pattern:

$$\frac{\mathrm{d}\varphi}{\mathrm{d}C} \quad \text{and} \quad \frac{\mathrm{d}}{\mathrm{d}C}\Big(\frac{\mathrm{d}\varphi}{\mathrm{d}C}\Big).$$

Fitting these two spatial derivatives to the binary's conservative energy $E(\Omega)$ and GW flux $\mathcal{F}(\Omega)$ yields the chirp mass M_c because the balance law $\mathrm{d}E/\mathrm{d}C = -\mathcal{F}/\mathrm{d}\varphi/\mathrm{d}C$ involves only **derivatives with respect to** C. In practice, you count fringes (phase) and arm-length deformations (meters); no seconds are needed to infer M_c or a luminosity distance (from the $1/R$ amplitude fall-off).

Pulsar timing arrays can be rephrased as **pulse-phase geodesy**. A pulsar supplies a spatial ruler in the form of an almost monochromatic wave train. What is usually called a "time-of-arrival residual" is simply a **phase** difference: an integer pulse count N plus a fraction $\delta\phi/2\pi$ compared to a reference odometer (Earth's orbital path length, or the advancing phase of a very stable local oscillator treated as spatial crests in a cavity). Red processes (GWs, plasma) shift the phase versus the baseline distance along the line of sight; the Hellings–Downs curve remains a purely angular correlation on the sky.

Cosmological parameter inference becomes a web of spatial relations. From $\{D_A(z),\, D_L(z),\, \chi(z)\}$ and the growth-of-structure equation written with $\ln a$ as the pace, you solve for the functions $\rho_j(a)$ and the curvature sign k that satisfy the single FRW constraint. Weak-lensing shear two-point functions are weighted line-of-sight integrals over the optical metric and the growth factor—again integrals over **scale** and **angle**, not over a clock.

Laboratory kinematics stays in distance-over-distance. A "speed" is always $v_{A|B} = \mathrm{d}\ell_A/\mathrm{d}\ell_B$. A "frequency" of a rotor is $\mathrm{d}\theta/\mathrm{d}\ell_B$, angle per meter of a reference belt. A "decay rate" is a hazard per odometer length κ, with survival $S(C) = e^{-\kappa C}$ and a half-length $C_{1/2} = \ln 2/\kappa$. Collision cross-sections are areas in configuration space; event counts are fluxes per unit reference length through an aperture of known geometry.

Page Seven — Canon of Timeless Physics: Axioms & Calculus

Axiom (Reality). A physical state is a configuration (q, p) (or fields and their momenta) constrained by $H(q, p) = E$ (or by the appropriate field constraints). A "history" is a chain of neighboring configurations that extremizes a length-like functional. All predictions are relations among distances, angles, and conserved quantities.

Relational pace. Choose an internal odometer C (distance ℓ_B, angle θ, scale a, etc.). The derivative "per unit change of C" is

$$\frac{\mathrm{d}F}{\mathrm{d}C} = \frac{\{F,\,H\}}{\{C,\,H\}} \quad \text{(classical)}, \qquad \frac{\mathrm{d}\langle \hat{F}\rangle}{\mathrm{d}C} = \frac{\left\langle \frac{i}{\hbar}[\hat{H}, \hat{F}]\right\rangle}{\left\langle \frac{i}{\hbar}[\hat{H}, \hat{C}]\right\rangle} \quad \text{(quantum)}.$$

Jacobi variational form (mechanics).

$$S_J[q] = \int \sqrt{2\big(E - V(q)\big)}\, \sqrt{m_{ij}\,\mathrm{d}q^i \mathrm{d}q^j}, \qquad \delta S_J = 0 \;\Rightarrow\; \text{physical chains}.$$

Hamilton–Jacobi constraint.

$$\frac{1}{2}\, m^{ij}\, \partial_i S\, \partial_j S + V(q) = E, \qquad p_i = \partial_i S.$$

Mutual speeds (keep "speed," no time).

$$v_{A|B} := \frac{\mathrm{d}\ell_A}{\mathrm{d}\ell_B}, \qquad \omega_{A|B} := \frac{\mathrm{d}\theta_A}{\mathrm{d}\ell_B}.$$

Work–momentum correlation (uniform force).

$$\frac{p(x)^2}{2m} + V(x) = E, \qquad p(x)^2 - p(x_0)^2 = 2m\,F\,(x - x_0).$$

Oscillator as a geometry.

$$\frac{p^2}{m} + m\omega^2 q^2 = 2E, \qquad \frac{\mathrm{d}q}{\mathrm{d}\ell_B} = \frac{(p/m)}{(p_B/m_B)}.$$

Central-force shape law (Binet).

$$\frac{\mathrm{d}^2u}{\mathrm{d}\phi^2} + u = -\frac{1}{\ell^2 u^2}\, F\!\left(\tfrac{1}{u}\right), \quad u = \frac{1}{r},\ \ \ell = \frac{L}{m}.$$

Elastic collision (junction constraints).

$$\sum_i \mathbf{p}_i = \sum_i \mathbf{p}'_i, \qquad \sum_i \frac{\mathbf{p}_i^{\,2}}{2m_i} = \sum_i \frac{\mathbf{p}_i'^{\,2}}{2m_i}.$$

Continuum kinematics (material map).

$$\chi:\ X \mapsto x, \qquad \text{incompressible: } \det\!\left(\frac{\partial \chi}{\partial X}\right) = 1.$$

Electromagnetism (timeless, differential forms).

$$F = \mathrm{d}A, \qquad \mathrm{d}F = 0, \qquad \mathrm{d}{*}F = J, \qquad S[A] = -\tfrac{1}{2}\!\int F \wedge {*}F + \int A \wedge {*}J.$$

Stat mech & thermo (equilibrium is geometry).

$$\Omega(E,V,N) = \!\int \delta(H-E)\,\mathrm{d}q\,\mathrm{d}p, \quad S = k_B \ln \Omega, \quad \frac{1}{T} = \Big(\frac{\partial S}{\partial E}\Big)_{V,N},\ \frac{P}{T} = \Big(\frac{\partial S}{\partial V}\Big)_{E,N}.$$

Canonical weight as bath geometry.

$$w(E_A) \propto e^{-\beta E_A}, \qquad \beta = \Big(\frac{\partial S_R}{\partial E_R}\Big)_{E_{\mathrm{tot}}}.$$

Liouville (no clock).

$$\mathcal{L}_{X_H} f = 0.$$

Diffusion/heat per odometer length.

$$\frac{\partial \rho}{\partial \ell_B} = \tilde{D}\,\nabla^2 \rho, \qquad \nabla\cdot(\kappa \nabla T) = 0.$$

Decay/chemistry as hazard per length.

$$\kappa = \lim_{\Delta\ell_B \to 0} \frac{\Pr(\text{react in } \Delta\ell_B \mid \ell_B)}{\Delta\ell_B}, \qquad S(\ell_B) = e^{-\kappa \ell_B}, \quad \ell_{1/2} = \frac{\ln 2}{\kappa}.$$

Quantum (constraint and conditionals).

$$(\hat{H} - E)\,|\Psi\rangle = 0, \qquad \mathsf{P}(a \mid c) = \frac{\|\Pi_a \Pi_c |\Psi\rangle\|^2}{\|\Pi_c |\Psi\rangle\|^2}.$$

Mutual-pace Schrödinger (with spatial odometer x_B).

$$i\hbar \frac{\partial}{\partial x_B} |\psi_A(x_B)\rangle = \nu_B^{-1} \left(\hat{H}_A + \hat{H}_{\text{int}}^{(A)}\right) |\psi_A(x_B)\rangle, \qquad \nu_B = \frac{i}{\hbar}[\hat{H}_B, \hat{x}_B] = \frac{\hat{p}_B}{m_B}.$$

Stationary wave & resolvent (fixed E).

$$\Big(-\frac{\hbar^2}{2m}\nabla^2 + V\Big)\psi_E = E\psi_E, \qquad G_E(q_2, q_1) = \Big\langle q_2 \Big| \frac{1}{E - \hat{H} + i0} \Big| q_1 \Big\rangle.$$

Jacobi path integral (reparametrization-invariant).

$$\mathcal{A}(q_2, q_1) \propto \sum_{\text{chains}} \exp\Big(\tfrac{i}{\hbar} S_J[q]\Big).$$

General Relativity (constraints on 3-geometry).

$$\mathcal{H}_i = -2\nabla_j \pi^j{}_i + \mathcal{H}_i^{(\text{matt})} = 0, \qquad \mathcal{H} = \frac{1}{\sqrt{\gamma}}\left(\pi^{ij}\pi_{ij} - \tfrac{1}{2}\pi^2\right) - \sqrt{\gamma}\,(R^{(3)} - 2\Lambda) + \mathcal{H}^{(\text{matt})} = 0.$$

BSW (Jacobi-type) action for GR.

$$S_{\text{BSW}} = \int \mathrm{d}\lambda \int \mathrm{d}^3x\, \sqrt{\gamma}\, \sqrt{R^{(3)} - 2\Lambda + \rho_{\text{matt}}}\, \sqrt{G^{ijkl}(\dot{\gamma}_{ij} - \mathcal{L}_\xi \gamma_{ij})(\dot{\gamma}_{kl} - \mathcal{L}_\xi \gamma_{kl})}.$$

Relational derivative on superspace.

$$\frac{\mathrm{d}F}{\mathrm{d}C} = \frac{\{F, H_{\text{tot}}\}}{\{C, H_{\text{tot}}\}}, \qquad H_{\text{tot}} = \int (N\mathcal{H} + N^i \mathcal{H}_i)\, \mathrm{d}^3x.$$

Optical geometry (lensing/redshift).

$$\gamma_{ij}^{\text{opt}} = N^{-2}\gamma_{ij}, \qquad \frac{\lambda_{\text{obs}}}{\lambda_{\text{em}}} = \frac{N(\text{em})}{N(\text{obs})}, \qquad \ell_{\text{opt}} = \int \sqrt{\gamma_{ij}^{\text{opt}}\, \mathrm{d}x^i \mathrm{d}x^j}.$$

Schwarzschild orbit (pure shape, perihelion advance).

$$\frac{\mathrm{d}^2 u}{\mathrm{d}\phi^2} + u = \frac{GM}{\ell^2} + 3GM\,u^2.$$

Gravitational-wave strain and phase (interferometric readout).

$$h \sim \frac{2\,\delta L}{L}, \qquad \Delta\varphi \approx \frac{2\pi}{\lambda_{\text{laser}}}\, h\, L, \qquad \frac{\mathrm{d}\varphi}{\mathrm{d}C} \text{ and } \frac{\mathrm{d}}{\mathrm{d}C}\left(\frac{\mathrm{d}\varphi}{\mathrm{d}C}\right) \text{ fit the source without clocks.}$$

Changes with timelessness in sciences

Physics Without Time Becomes Pure Geometry of Change

Right now, physics describes movement as "position changing over time."
But in truth, movement is just **position changing relative to other positions and states**.
If time disappears, physics becomes:

- relationships between states
- transformations of fields
- interactions of matter
- geometric flows
- sequential reconfigurations of systems
-

This means motion is no longer "per second," but per event or per interaction.
Acceleration becomes rate of change of state, not rate of change of velocity in time.

Quantum mechanics becomes probability of transitioning from one state to another, not evolving in a temporal dimension.

Relativity becomes spatial relationships shifting under energy and mass, not clocks bending.

Every equation involving *t* becomes a measure of *ordered changes*, not a cosmic stopwatch.
When false constraints fall, understanding deepens.

Chemistry Without Time Becomes Reaction Chains

Chemistry currently says,
"This reaction takes 5 seconds."
But reactions do not "take time."

They follow:

- collision rates
- activation energies
- molecular reconfigurations

- environmental conditions

So chemistry becomes:

If these conditions are met, these events follow.

No timeline. Only sequence.

Catalysts stop being “time-savers.”
They become “event-shorteners” — reducing the number of steps needed for transformation.

Reaction speed becomes
reaction density (how many molecular events occur per sequence), not “per second.”

This would drastically simplify modeling complex reactions.

Pharmaceuticals, materials science, nanotech — all would gain clarity.

Mathematics Without Time Becomes State Mathematics

If time is removed, mathematics shifts from differential calculus to **event calculus**.

Derivatives become
change per event.

Integrals become
accumulated change across sequences.

No “t,” no time axis.

Only:
- state spaces
- transition paths
- adjacency
- ordering
- geometry of change

This opens mathematics to completely new forms — topological event networks, sequence geometries, dynamic mappings without a temporal parameter.

It breaks the cage of linear thinking.

Technology Explodes

Removing time from equations destroys a limitation that never existed in nature. Once engineers stop designing machines around time-based constraints, several breakthroughs become possible.

Computing

Processors no longer measured in “cycles per second,” but in **events per sequence**, enabling architectures where operations are not bound to a universal clock — far more efficient and parallel.
Quantum computing becomes cleaner: qubits switch states, not “evolve in time.”

Energy

Energy production modeled by **state transitions**, revealing new reaction pathways, potentially unlocking technologies similar to:

- ultra-efficient molecular rearrangement
- stable high-density storage
- event-triggered fusion frameworks

Transportation

Velocity becomes **change of position per event**, paving the way for systems where movement synchronizes with external fields, not with “time.”
This could lead to:

- field-driven locomotion
- new forms of propulsion
- event-based navigation systems

AI and robotics

Current systems depend heavily on time-stepped simulation.
Remove time, and you get continuous-event reasoning engines with far greater natural intelligence.

Medicine

Aging no longer modeled as “time-dependent deterioration,” but as **sequence-dependent decay**, allowing direct intervention in event pathways rather than futile attempts to slow “time.”
This opens the door to:

- structural repair at the sequence level
- preventing decay events before they occur

- extending functional lifespan naturally

The Biggest Breakthrough: Freedom from a False Dimension

Most scientific fields treat time as a variable because they inherited it from Newton, who imagined time as absolute. Later, Einstein reshaped it but still accepted its existence.

This model rejects the premise entirely.

Without time:

- the universe becomes a changing configuration
- causality becomes event-necessity
- motion becomes reconfiguration
- decay becomes material amortization
- growth becomes structural transformation
- perception becomes ordered awareness

No dimension is “flowing.” Only reality is unfolding.